SERENSEN, S. V.

USSR/ Engineering - Heat treating

Card 1/1 Pub. 128 - 13/28

Authors : Sharyy, A. Ya., Eng; Lozinskiy, M. G., Cand. of Mech. Sc.; Serensen, S. V., Active Mem., Acad. of Sc., Ukr. SSR.; and Garf, M. E., Cand. of Mech. Sc.

Title : Concerning the efficient heat treating of crankshafts for the DT-54 tractor diesel engines

Periodical : Vest. mash. 35/6, 56 - 60, Jun 1955

Abstract : During the period 1949-1951, of from 3-0.8% of all DT-54 diesel engines manufactured by the Stalingrad Tractor Plant, were rejected due to defects in engine crankshafts. Approximately 91.2% of these defects were caused by the breaking of crank webs and pins. For this reason, operational tests were conducted to determine the magnitude of torque, bending, dynamic load, and vibration factors in crankshaft operation, and to determine the influence efficiency of crankshafts. Three USSR references (1950-1955). Drawings; illustrations; graphs; table.

Institution : .....

Submitted : .....

SERENSEN, S. V.

"Fatigue resistance in connection with toughening and constructional factors" a paper presented at International Conference on Fatigue on Metals, London, Sep 56.

DSI. No. 103

SERENSON, S. V.

"On the endurance of cast-iron and steel under repeated loading of varying amplitude," a paper presented at International Conference on Fatigue of Metals, London, Sep. 56.

DSI. No., 103

SERENSEN, S.V., otvetstvennyy redaktor; GRIGOR'YEV, Ye.N., redaktor izdatel'stva; PAVLOVSKIY, A.A., tekhnicheskiy redaktor

[Vibration in turbomachines; a collection of articles] Kolebaniia v turbomashinakh; sbornik statei. Moskva, 1956. 205 p. (MLRA 9:8)

1. Akademiya nauk SSSR. Institut mashinovedeniya.
(Turbomachines--Vibration)

SOV/124-58-3-3484

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 3, p 127 (USSR)

AUTHORS: Serensen, S. V., Slutskaya, O. B.

TITLE: The Relationship Between the Strength of Tractor Crankshafts and the Wear of Main Bearings (Prochnost' kolenchatykh valov traktornykh dvigateley v svyazi s iznosom opor)

PERIODICAL: V sb.: Povysheniye iznosostoykosti i sroka sluzhby mashin. Kiyev - Moscow, Mashgiz, 1956, pp 183-190

ABSTRACT: Statistical data confirm the existence of a regular pattern of variations in the stressed state and appearance of fatigue stresses in tractor crankshafts as a result of wear. This circumstance is responsible for the destruction of crankshafts which had been subjected to 50×10^6 or more cycles of stress reversal. Standard methods of structural mechanics are employed in computation of relative displacements of main bearings and determination of the magnitude of additional stresses which are created when the bearings are no longer aligned along a common axis. The magnitude of forces acting on a new crankshaft supported on misaligned bearings was determined experimentally. It was established that the maximum permissible misalignment of

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The Relationship Between the Strength of Tractor Crankshafts (cont.)

bearings in a D-54 engine may not exceed 0.1-0.15 mm. The elasticity of the crankcase does not influence the strength of the crankshaft. It was found that nonuniform wear of main bearings is the primary cause of fatigue failure of crankshafts which have been in operation for a long period of time. In the process, owing to a statically indeterminate condition, a re-distribution of forces takes place; a number of sections become overloaded and the safety margin is sharply reduced. Inaccuracies in manufacture and incorrect assembly affect the reliability of crankshafts in an analogous manner.

V. K. Pereverzev

SERENSEN, S. V.

SERGIYEVSKIY, A.D. [translator]; GASTEV, V.A., professor, doktor tekhnicheskikh nauk, retsenzent; SERENSEN, S.V., redaktor; KUSHELEV, N.Yu., kandidat tekhnicheskikh nauk, redaktor; SOKOLOVA, L.V., tekhnicheskiy redaktor

[Problems in fatigue breakdown of steel; a collection of translations] Voprosy ustalostnogo razrusheniia stalei; sbornik perevodnykh statei. Sokrashchennye perevody A.D.Sergievskogo, pod red. S.V.Serensena. Moskva, Gos.nauchno-tekhn. izd-vo mashinostroit.lit-ry, 1957. 150 p. (MLRA 10:8)
(Steel--Fatigue)

SERENSEN, S. V.

KOVALENKO, A.D.; KORNOUKHOV, M.V.; PISARENKO, G.S. [Pysarenko, H.S.]; SAVIN, G.M. [Savin, H.M.]; SERENSEN, S.V.

Engineering research developed by the institutes of the Academy of Sciences of the Ukrainian S.S.R. in 1956. Prykl.mekh. 3 no.4: 487-490 '57. (MIRA 11:2)
(Ukraine--Engineering research)

SERENSEN, S. V. (Moscow)

"A Few Peculiarities of the Process of the Breaking of Alloys at High Temperatures." (Section I)

Paper scheduled for presentation at Annual Autumn Meeting of French Society of Metallurgy, Paris, France 20-25 Oct 58.

SERENSEN, S. V., SHNEYDEROVICH, R. M. and SVINOGRODSKIY, N. V.

"On the Analysis of Deformed Conditions of Plastic Compounds on the Basis of the Method of Changeable Elasticity Parameters."

report submitted Third Intl. Congress of Rheology, Bad Oeyngausen, GFR, 23-30 Sep 58.

18(7);28(5) PHASE I BOOK EXPLOITATION SOV/1970

Serensen, S.V., M.N. Stepnov, V.P. Kogayev, and Ye. V. Giatsintov

Issledovaniye rasseyaniya kharakteristik vynoslivosti konstruktsionnykh alyuminiyevykh splavov v svyazi s tekhnologiyey ikh proizvodstva (Research on the Scattering of Endurance Characteristics of Structural Aluminum Alloys in Connection With Production Technology) Moscow, Oborongiz, 1958. 122 p. 2,600 copies printed (Series: Moscow. Aviatsionyy tekhnologicheskiy institut. Trudy, vyp. 35)

Sponsoring Agency: Moscow. Aviatsionnyy tekhnologicheskiy institut.

Ed.: T.M. Fedorova, Candidate of Technical Sciences; Resp. Ed.: A.S. Zaymovskaya, Engineer; Ed. of Publishing House: E.I. Shekhtman; Tech. Ed.: L.A. Garnukhina.

PURPOSE: The book is intended for engineering, technical, and scientific personnel, and for graduate students (aspiranty) and students of machine building and metallurgy.

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tion Materials); M.Ya. Shashin, A.I. Kochetov, and A.D. Krolevetskiy (problems of metal fatigue). There are 37 references: 7 Soviet, 27 English, and 3 German.

TABLE OF CONTENTS:

The Third Scientific and Technical Conference in Kiyev on the Improvement of the Wear Resistance and Service Life of Machines

unequal wear and the formation of clearances in assemblies and as a result of a change in the physical and chemical condition of contact surfaces.

B.D. Grozin, Corresponding Member of the Ac.Sc. Ukrainian SSR, in a paper entitled "The Complex Method of Analysis of Components Working Under the Conditions of Rolling Friction" presented a method which includes the combined use of electron microscope, X-ray diffraction and spectroscopic analyses to judge the condition of the surface layers in association with wear tests and static mechanical tests under tri-axial non-uniform compression at different temperatures. It is claimed that with the help of this method, the relation between the contact endurance strength of steel and the factors defining the condition of the surface can be established.

In a paper "On Temperature Measuring Methods in the Friction Process between Solid Bodies", by S.A. Sukhov, Candidate of Technical Sciences, a method for measuring the temperature gradients in the immediate vicinity of the friction surfaces with the help of a natural thermocouple was presented. Both sliding bodies (pin and ring) are made of the same material, but the pin end face is covered with a thin layer of another metal

Card2/8

KOVALENKO, A.D.; KORNOUKHOV, M.V. [deceased], akademik; PEN'KOV, O.M.; PISARENKO, G.S. [Pysarenko, H.S.]; SAVIN, G.M. [Savin, H.M.], akademik; SERENSEN, S.V., akademik; FILIPPOV, A.P.

Development of the problem "Scientific fundamentals of force and plasticity" by the institutes of the Academy of Sciences of the Ukrainian S.S.R. Prykl. mekh. 4 no. 3:356-358 '58. (MIRA 13:8)

1. Institut stroitel'noy mekhaniki AN USSR, chlen-korrespondent AN USSR (for Kovalenko). 2. Laboratoriya gidravlicheskikh mashin AN USSR, chlen-korrespondent AN USSR (for Filippov). 3. AN USSR i Institut stroitel'noy mekhaniki AN USSR (for Kornoukhov). 4. Institut metallokeramiki i spetssplavov AN USSR, chlen-korrespondent AN USSR (for Pisarenko). 5. AN USSR i Institut mashinovedeniya AN USSR (for Serensen). 6. Institut gornogo dela AN USSR, chlen-korrespondent AN USSR (for Pen'kov). 7. AN USSR i Institut matematiki AN USSR (for Savin).

(Plasticity)

AUTHORS: Serensen, S.V., Kogayev, V.P., Stepnov, M.N., Glazunov, Ye.V. 32-3-26/52

TITLE: On the Law Concerning the Distribution of Durability in Fatigue Tests (O zakone raspredeleniya dolgovechnosti pri ustalostnykh ispytaniyakh)

PERIODICAL: Zavodskaya Laboratoriya, 1958, Vol. 24, Nr 3, pp. 324-329 (USSR)

ABSTRACT: In connection with the statement made to the effect that the logarithmic law of the distribution of durability is not confirmed by experiments, other distribution functions were suggested by Frendenthal and Gumbel [Ref.6], Weibull [Ref.7] and others. In the present paper the correctness of the logarithmic standard law was checked, and the existence of a "sensitivity threshold according to cycles" was established as a fact. 463 samples were investigated. A graphical drawing for tensions of 30, 24 and 21 kg/mm^2 is given; the curve for 21 kg/mm^2 indicates the phenomenon of the sensitivity threshold. In the course of further experiments the latter is found also in the case of greater stresses. From the experiments and a mathematical process the hypothesis expounded already in an

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On the Law Concerning the Distribution of Durability in Fatigue Tests

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earlier work [Ref.10] is confirmed, so that the conclusion may be drawn that the law mentioned in the title is applicable in the case of the static treatment of results obtained by fatigue tests. There are 3 figures, 1 table, and 10 references, 6 of which are Slavic.

ASSOCIATION: Moscow Institute for Aviation Technology (Moskovskiy aviatsionnyy tekhnologicheskiy institut)

AVAILABLE: Library of Congress

1. Fatigue (Mechanics) Durability-Distribution 2. Mathematics-Theory

Card 2/2

32-24-4-48/67

AUTHOR: Serensen, S.V.

TITLE: Questions of Metal Fatigue Which Were Investigated at the Session of the French Metallurgical Society (Voprosy ustalosti metallov, rassmotrennyye na sessii frantsuzkogo metallurgicheskogo obshchestva)

PERIODICAL: Zavodskaya Laboratoriya, 1958, Vol. 24, Nr 4, pp. 482-487 (USSR)

ABSTRACT: A detailed report on the session which took place from October 7 to October 12, 1957 at Paris, in which, among others, the sections for Rheology and Fatigue of the above mentioned society took part, was given. The USSR was represented by members of the Institute for Mechanical Engineering and of the Institute for Metallurgy, AS USSR; further participants were the corresponding member of the AS USSR I.A. Oding (Section for Rheology), Dr. of technical sciences G.V. Uzhik, Candidate of technical sciences A.G. Nikonov (Section for Metal Fatigue). Reports (with a short account of their contents) by the following authors are mentioned: M Weisz (IRSID), C. Crussard and M. Weisz (IRSID), W. Weibull (Sweden), C.Daubertes, M.Renout and R. Cazaud (SIMCA), I. Plateau, C. Crussard, I.Faquet;

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Questions of Metal Fatigue Which Were Investigated at the Session of the French Metallurgical Society 32-24-4-48/67

V.S.Ivanova (Metallurgical Institute,AS USSR), F.Gatto (Italy), J.de Fauquet; Weisz and Cazaud (IRSID), Franklin (England), A.Fenner and Field (England), A.Royez and J.Pomey (RENAULT), Korita and Linhard (Institute for Rheology and Materials, Prague), J.Clayton-Cave, E.Ineson and E.Taylor (England), A.Fotiadi (France), Cazaud (IRSID), P.Mathon, R. Lafont, A.Royez and J.Pomey (RENAULT), A.Royez, L.Akel, J.Pomey (RENAULT), L.Locati (Italy, FIAT), G.V.Uzhik (Institute for Mechanical Engineering AS USSR) A.G.Nikonov (Metallurgical Institute AS USSR), P.Kuhn (USA), E.W. Wilkins (USA), F.Bastenaire (IRSID), R.Castro and A.Gueussier (France), R.Esquere (France), F. Girard and G.Vidal (France). A detailed account of work carried out in the laboratories of the Renault Works and the Institute IRSID in France is given. The development of statistic working materials, the increase of frequency in fatigue tests, measuring the dependence between stresses and deformation in the case of alternate stresses as well as the utilization of electron microscopy are recommended to be dealt with as problems of immediate interest for Soviet laboratory investigations.

1. Metals--Fatigue 2. Metallurgy--France

Card 2/2

AUTHORS: Serensen, S. V., Kotov, P. I. SOV/32-24-9-23/53

TITLE: On the Question of the Technique for the Performance of Thermal Fatigue Tests (K voprosu o metodike provedeniya ispytaniy na termicheskuyu ustalost') Survey (Obzor)

PERIODICAL: Zavodskaya Laboratoriya, 1958, Vol 24, Nr 9, pp 1097-1106 (USSR)

ABSTRACT: The Russian scientist D. K. Chernov (Ref 1) was the first to point to the phenomenon of thermal fatigue. The paper under discussion describes the deformation process in thermal fatigue and, by way of illustration, gives a diagram of the amplitude change in the plastic deformation of austenite steels, as obtained by Forrest (Ref 2). With regard to the question of the influence of various factors on the size and distribution of non-stationary thermal stresses, the papers by S. P. Timoshenko (Ref 9), Yu. N. Tayts (Ref 10), and Jaeger (Yeger) (Ref 11) are mentioned, as are those by V. A. Lomakin (Refs 5-7). The deformation rate in cyclic heating is explained in connexion with the investigations made by F. F. Vitman and N. A. Zlatin (Refs 12,13) and Nadaj (Nadai) (Ref 14). In the section on the role of stresses of the second type (thermostructural), the

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On the Question of the Technique for the Performance of Thermal Fatigue Tests. Survey

experiments made by Boas and Honeycombe (Boas and Khonekomb) (Ref 15) are given, as are the papers by V. I. Arkharov and A. I. Semenova (Ref 18) and K. Chizuik and R. Kel'man (Ref 17). With regard to the investigations of the influence, on the properties of the material, of a cyclic temperature change (without thermal stress), the data obtained by R. N. Sizova and N. Ya. Nikolenko are presented, the corresponding alloys being specified. The growth of the fissures has been investigated, inter alia, by L. A. Glikman (Ref 29). In connexion with the current methods for the determination of thermal fatigue resistance in materials, the data obtained by A. A. Bochvar (Ref 32), experiments conducted by Beutele and Lowthian (Beutele and Lovtian) (Ref 35), and by A. A. Klypin (Ref 25), and investigations made by Coffin (Koffin) (Refs 37-39), V. N. Kuznetsov (Ref 40), and A. V. Ratner (Refs 26,36) are given, together with the corresponding explanations. By way of conclusion, the reproducibility of the process of thermal fatigue is discussed, and a detailed conclusion is given.
There are 13 figures, 1 table, and 40 references, 29 of which are Soviet.

24(11), 18(3) SOV/32-24-11-21/37

AUTHORS: Serensen, S. V., Kozlov, L. A.

TITLE: Linear Interpretation of Accumulation of Defects and Characteristic Curves of Resistance Against Fatigue and Static Endurance Failure (Lineynaya interpretatsiya nakopleniya povrezhdeniya i kharakteristiki soprotivleniya ustalostnomu i dlitel'nomu statricheskomu razrusheniyu)

PERIODICAL: Zavodskaya Laboratoriya, 1958, Vol 24, Nr 11, pp 1378-1392 (USSR)

ABSTRACT: This study deals with questions of processing the results of tests obtained by repeated overloading and overheating of the samples. Apart from the results of tests obtained by Miller (Ref 13), fatigue diagrams of the deformed alloy EI617, at temperatures of 700-900°, of the cast alloy ZhS6 at 800-1000° and of the steel 18KhNVA at 300-550° (Ref 19) are given and explained. It is noted that the diagrams of the fatigue and static endurance limit can be represented in the logarithmic coordinates "tension-endurance" (at a constant temperature) and "temperature-endurance" (at a constant tension) as sections of straight lines the inclination of which characterizes fa-

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Linear Interpretation of Accumulation of Defects and Characteristic Curves of Resistance Against Fatigue and Static Endurance Failure

tigue resistance or endurance resistance. In case of repeated overloading and overheating the function between endurance Z and the variable parameter x is more complicated, the above diagrams, however, can still be represented in the logarithmic coordinates

$$\lg \frac{z_2}{Z_1 - z_1} \quad \text{and} \quad \lg \frac{x_2}{x_1}$$

as sections of straight lines the inclination of which (coefficient q in the equation of the curve) characterizes the resistance against cyclic and repeated overloading and overheating. The value q characterizes the fatigue resistance in the interval between the tension amplitudes of 1 and $\left(\frac{\sigma_2}{\sigma_1}\right)_o$ and is specific for every material. In the case of $\frac{\sigma_2}{\sigma_1} > \left(\frac{\sigma_2}{\sigma_1}\right)_o$ the sum of defects approaches the linear expression

Linear Interpretation of Accumulation of Defects and Characteristic Curves of Resistance Against Fatigue and Static Endurance Failure

$\sum \frac{n}{N} = 1$. Therefore first the diagrams of the static and then those of the repeated loads should be determined. The values p and q are determined and then compared to each other. Observations were made that agree with the data given by Corten and Dolan (Korten) (Ref 7). The q-values for the steels 12KhNZA = 7.1 and 40KhNMA = 10 and for the alloys EI437A, EI598 and EI617 are given. Also the test results obtained by Robinson (Robinzon) (Ref 14) and Miller (Ref 13) are explained and data concerning the steels M-252, S-816 and 16-25-6 (q=60 and approximately 45 for 16-25-6) are given.
There are 21 figures and 21 references, 10 of which are Soviet.

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SERENSEN S.V.

AUTHOR: Serensen, S. V., Member of the AS, Ukrainian SSR 30-1-25/39

TITLE: A Meeting of the French Society of Metallurgists (Sessiya Frantsuzskogo obshchestva metallurgov)

PERIODICAL: Vestnik AN SSSR, 1958, Vol. 28, Nr 1, pp. 107-108 (USSR)

ABSTRACT: The meeting took place in Paris from October 7 - 11, 1957. Problems of material fatigue were discussed, with French, English, Italian, Russian, American and Swedish scientists taking part. The processes in fatigued steel were determined by means of measurements of the magnetic resistance. Problems of fatigue with increased temperatures were discussed. Experiments with motor elements, auto--chassis and riveted airplane constructions were discussed. The Soviet scientists reported on fatigue problems:
S. V. Serensen (Fatigue of Cast Iron in Connection with the Character of State of Stress and Structure),
G. V. Uzhik (On the Influence of the Concentration of Tensional Stress on Fatigue),
A. G. Nikonov (On the Fatigue Phenomena in Rolling with Sliding),
I. A. Oding (On the Structure Theory of Creeping).

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A Meeting of the French Society of Metallurgists 30-1-25/39

AVAILABLE: Library of Congress

1. Metallurgy-France

Card 2/2

PONOMAREV, S.D., prof.; TIKHOMIROV, Ye.N., prof.; SERENSEN, S.V., prof.; MALININ, N.N., prof.; POPOV, A.A., prof.; KRYUKOVSKIY, S.S., prof.; SOKOLOV, S.N., prof.

[Program of the course "Strength of materials" for departments of mechaniced engineering in technical institutes] Programma kursa "Soprotivlenie materialov" dlia mashinostroitel'nykh i mekhanicheskikh spetsial'nostei vysshikh tekhnicheskikh uchebnykh zavedenii. Moskva, Izd-vo "Vyshaia shkola," 1959. 15 p. (MIRA 15:1)

1. Russia (1923- U.S.S.R.) Ministerstvo vysshego i srednego spetsial'nogo obrazovaniya.
(Strength of materials—Study and teaching)

SERENSEN, S.V., akademik, otv.red.; KLIMOVITSKIY, Ya.A., red.izd-va; VOLKOVA, V.V., tekhn.red.

[Vibrations in turbomachines; a collection of articles] Kolebaniia v turbomashinakh; sbornik statei. Moskva, Izd-vo Akad.nauk SSSR, 1959. 117 p. (MIRA 12:6)

1. Akademiya nauk SSSR. Institut mashinovedeniya. 2. AN USSR (for Serensen).
(Turbomachines--Vibration)

RAYEVSKIY, Nikolay Petrovich, kand.tekhn.nauk; ARTOBOLEVSKIY, I.I., akademik, otv.red.; BLAGONRAVOV, A.A., akademik, red.; BRUYEVICH, N.G., akademik, red.; DIKUSHIN, V.I., akademik, red.; SERENSEN, S.V., akademik, red.; PINEGIN, S.V., prof., doktor tekhn.nauk, red.; LEVITSKIY, N.I., prof., doktor tekhn.nauk, red.; KOBRINSKIY, A.Ye., doktor tekhn.nauk, red.; BESSONOV, A.P., kand.tekhn. nauk, red.; BELYANIN, P.N., red.izd-va; ASTAF'YEVA, G.A., tekhn. red.

[Indicators of mechanical parameters of machines] Datchiki mekhanicheskikh parametrov mashin. Moskva, Izd-vo Akad.nauk SSSR, 1959. 186 p. (MIRA 13:1)

1. AN USSR (for Serensen).
(Measuring instruments) (Machinery--Testing)

DIMENTBERG, Fedor Menas'yevich, doktor tekhn.nauk; SERENSEN, S.V., akademik, otv.red.; ARTOBOLEVSKIY, I.I., akademik, otv.red.; BLAGONRAVOV, A.A., akademik; red.; BRUYEVICH, N.G., akademik; red.; DIKUSHIN, V.I., akademik, red.; PINEGIN, S.V., prof., doktor tekhn.nauk, red.; LEVITSKIY, N.I., prof., doktor tekhn.nauk, red.; KOBRINSKIY, A.Ye., doktor tekhn.nauk, red.; RAYEVSKIY, N.P., kand.tekhn.nauk, red.; BESSONOV, A.P., kand.tekhn.nauk, red.; MELEYEV, A.S., red.izd-va; KUZ'MIN, N.K., tekhn.red.; MAKUNI, Ye.V., tekhn.red.

[Bending vibrations of revolving shafts] Izgibnye kolebaniia vrashchaiushchikhsia valov. Moskva, Izd-vo Akad.nauk SSSR, 1959. 246 p.

1. Akademiya nauk USSR (for Serensen).
(Vibration) (Shafting)

SERENSEN S. V.

CHERKUDINOV, Sergey Aleksandrovich; ARTOBOLEVSKIY, I.I., akademik, otv.red.; BLAGONRAVOV, A.A., akademik, otv.red.; BRUYEVICH, N.G., akademik, red.; DIKUSHIN, V.I., akademik, red.; SERENSEN, S.V., akademik, red.; PINEGIN, S.V., prof., doktor tekhn.nauk, red.; LEVITSKIY, N.I., prof., doktor tekhn.nauk, red.; DIMENTBERG, F.M., doktor tekhn.nauk, red.; KOBRINSKIY, A.Ye., doktor tekhn.nauk, red.; RAYEVSKIY, N.P., kand.tekhn.nauk, red.; BESSONOV, A.P., kand.tekhn.nauk, red.; KUDASHEV, A.I., red.izd-va; ASTAF'YEVA, G.A., tekhn.red.

[Synthesis of flat hinged-lever mechanisms; problems on the reproduction of a continuous function on a given section] Sintez ploskikh sharnirno-rychazhnykh mekhanizmov; zadachi o vosproizvedenii nepreryvnoi funktsii na zadannom otrezke. Moskva, Izd-vo Akad.nauk SSSR, 1959. 321 p. (MIRA 13:1)

1. AN USSR (for Serensen).
(Machinery, Kinematics of)

RATNER, Sof'ya Isaakovna; SERENSEN, S.V., retsenzent; ZILOVA, T.K., kand.tekhn.nauk, red.; KUZNETSOVA, A.G., izdat.red.; ROZHIN, V.P., tekhn.red.

[Breakdown caused by repeated loads] Razrushenie pri povtornykh nagruzkakh. Moskva, Gos.izd-vo obor.promyshl., 1959. 351 p. (MIRA 12:8)

1. Deystvitel'nyy chlen AN USSR (for Serensen).
(Strength of materials)

85183
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A005/A001

18.8200

Translation from: Referativnyy zhurnal, Mashinostroyeniye, 1960, No. 19, pp. 20-21, # 103606

AUTHOR: Serensen, S. V.

TITLE: On the Accumulation of Fatigue Defect in Cast Iron With Globular Graphite at Alternating Bending

PERIODICAL: V sb.: Nekotoryye probl. prochnosti tverdogo tela, Moscow-Leningrad, AN SSSR, 1959, pp. 273-279

TEXT: Data from some investigations are considered on the accumulation of fatigue defects in cast iron with globular graphite shape on ferrite matrix (ferrite cast iron) and on perlite matrix (perlite cast iron). The defect accumulation is characterized by changes in the fatigue curve parameters and addition of relative durabilities, depending on the unsteady loading conditions. In ferrite cast iron, overloading causes hardening and increase of the exponent of the fatigue curve (from 8.5 to 14), and only in the range of small numbers of cycles (10^5 - 10^4 and less) and large stress amplitudes $\sigma > -1.7\ \sigma_{-1}$ the

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A005/A001

On the Accumulation of Fatigue Defect in Cast Iron With Globular Graphite at Alternating Bending

overloading causes defect. In perlite cast iron, on the contrary, overloading causes defect and decrease of the fatigue curve exponent (from 15 to 9.3), and only at small numbers of load cycles (10^5 - 10^4) the overload does not cause a defect. The fifference of the overloading effect on the fatigue resistance of the tested cast irons is explicable by the difference in the structure matrices. In the ferrite cast iron matrix, repeated strains cause coli-hardening, increased hardness, and inhibition of the fatigue defect, in consequence of which hardening is observed. In the perlite cast iron matrix, fatigue fissures emerge already at an early stage of the cyclic loading near graphite inclusions, and these fissures decrease the further fatigue resistance.

U. A. M.

Translator's note: This is the full translation of the original Russian abstract.

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SOV/122-59-6-4/27

AUTHORS: Serensen, S.V., Member of the Ac.Sc. Ukrainian SSR, Kogayev, V.P., Candidate of Technical Sciences and Beksh, T.A., Engineer

TITLE: Investigation of the Fatigue Resistance of the Metal in a Full-scale Blade of a Variable Pitch Hydraulic Turbine

PERIODICAL: Vestnik mashinostroyeniya, 1959, Nr 6, pp 17-20 (USSR)

ABSTRACT: Test results are given comparing the fatigue endurance strength of standard laboratory specimens and specimens of full-scale thickness cut out from hydraulic turbine blades made by the LMZ (Leningrad Metal Works) of 20Kh13N-L steel. The fatigue tests were carried out at the Institut mashinovedeniya AN SSSR (Mechanical Science Institute of the Ac.Sc., USSR), with the help of special electromagnetic vibrator test rig. A sonic frequency valve generator supplies the vibrator which yields an exciting force of 280 kg at 200 c.p.s. The blade steel with a composition of 0.2% C, 0.56% Si, 0.42% Mn, 0.02% S, 0.02% P, 13.07% Cr and 0.57% Ni has an ultimate tensile strength of about 55 kg/mm^2 and an elongation of about 7-10%, according to

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Investigation of the Fatigue Resistance of the Metal in a Full-scale Blade of a Variable Pitch Hydraulic Turbine

size. Several combinations of types of loading were applied. Some in tension-compressions on a Schenck machine. 16 mm long strain gauges of 95 ohms were used to measure the stress. Most tests were carried out at resonance and stopped with the appearance of fatigue cracks. Test results are shown in s-N curves (Figures 6-9) and a Table 2. Specimens with substantial defects had an endurance limit of 6 kg/mm^2 and those without large defects of about 9 kg/mm^2, both in bending of large specimens (diameter 40-100 mm). Specimens of 7.5 mm diameter cut from full-scale components had a minimum endurance limit of 22.5 kg/mm^2 but showed substantial scatter of values even at the endurance limit. These were tested by bending in rotation. Specimens tested in tension-compression had an endurance limit of 14.3 kg/mm^2 (height of specimen 10 mm). Specimens of 20 mm height, tested in bending, had a limit of 15 kg/mm^2. In all, the endurance limit of full-scale

Investigation of the Fatigue Resistance of the Metal in a Full-scale Blade of a Variable Pitch Hydraulic Turbine

samples was up to 4 times lower than that of small-diameter laboratory samples in the same material. In spite of this, the fatigue strength reserve factor was shown to be adequate.
There are 9 figures and 2 tables.

Card 3/3

SERENSEN, S.V.; BUGLOV, Ye.G.

Programming of fatigue tests under conditions of statistical type stresses. Zav.lab. no.11:1352-1358 '59. (MIRA 13:4)
(Materials --Testing)

16(2) SOV/32-25-6-26/53

AUTHORS: Serensen, S. V., Borodin, N. A.

TITLE: On the Statistical Interpretation of the Results of Static Fatigue Tests (O statisticheskoy obrabotke rezul'tatov dlitel'nykh staticheskikh ispytaniy)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 6, pp 722 - 726 (USSR)

ABSTRACT: To obtain reliable results in the determination of the limit of static fatigue strength at a given time and temperature several research workers (Refs 1,2) suggest that tests be carried out on 15-20 samples at various stress levels, and that results be interpreted statistically (Refs 3-5). This is based on the assumption that the dispersion of the experimental values obtained under equal conditions obeys one of the probability laws of distribution. The present paper analyzes the distribution law of the test duration τ (which is necessary for the destruction under a certain stress) as well as the corresponding reduction of the cross section at the sample neck ψ_k on destruction. Tests on 100 standard samples of the aluminum alloy V-95 under stresses of 15 kg/mm^2 and temperatures of 200 $\pm$ 2° were made on K-3A machines for this purpose. The durability τ of the samples does not obey the normal distribution law (Fig 1), while

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the values of $lg\tau$ and $lg\psi_k$ settle along a straight line and thus exhibit a normal distribution. The parameters of the distribution function of the quantities $lg\tau$ and $lg\psi_k$ are given (Table 1), and it is stated that the hypothesis of the distribution normality for $lg\tau$ and $lg\psi_k$ is sufficiently reliable. The results of static tests on four stress levels on V-95 samples are given as an example of a statistical interpretation (Fig 3), as well as the parameters of the distribution function of the 90% reliability intervals (Table 2). The fatigue strength narrows proportionally to stress. The statistical interpretation described was made use of for the evaluation of the influence exerted by silicon impurities in the V-95 alloy upon fatigue strength and plasticity. A decrease in the Si content from 0.5% to 0.03% causes a rise in the value ψ_k from 45-50% to 75-85%. Pertinent data of destruction probability, as well as other comments with respect to the test accuracy are also given (Table 3). There are 6 figures, 3 tables, and 7 references, 5 of which are Soviet.

28(5)
AUTHORS: Serensen, S. V., Kotov, P. I.

05736
SOV/32-25-10-25/63

TITLE: Tests by Periodic Thermal Stress of Variable Intensity in Connection With the Investigation of Thermal Fatigue

PERIODICAL: Zavodskaya laboratoriya, 1959, Vol 25, Nr 10, pp 1216-1223 (USSR)

ABSTRACT: To rate the stresses under nonstationary thermal conditions for a massive cylinder of the EI 437 B alloy (diameter 10 mm), the stresses and deformations (within the elasticity limits) appearing at periodic temperature variations on the surface at a rate of 100°/sec (heating from 0 to 800° and cooling from 800 to 0°) were determined. The computations of the measurement results (Fig 1) show that considerable thermal stresses exceeding the flow limit as well as considerable plastic-elastic deformations (about 0.5 - 0.7%) develop. To investigate the resistance to destruction of alloys on periodic appearance of such deformations, a device like that by Coffin (Ref 3) may be used as has been done in the present case (Fig 2). The circuit scheme (Fig 3) of the device ensures the temperature conditions desired, one of the three thermocouples attached to the sample being connected to a

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Tests by Periodic Thermal Stress of Variable Intensity in Connection With the Investigation of Thermal Fatigue

thermostat of type ERM-47. The coolant (air or water) is supplied by a special electromagnetic valve. The sample itself (Fig 4) is thin-walled and tubular with a sample length of 70 mm. The temperature distribution along the sample was tested by welding 11 thermocouples along the latter (Fig 5) and carrying out measurements under various temperature conditions. It was found that the temperature distribution takes place regularly. The diagrams obtained for the stress variations (Fig 7), for the change in the elastic-plastic deformation (Fig 8), and the deformation of the EI 437 B alloy (Fig 9) under tensile and compression stresses at different temperature conditions are given. The method of determining the thermal fatigue is described, and the results obtained for the EI 437 B alloy are indicated (Table). There are 9 figures, 1 table, and 5 references, 4 of which are Soviet.

SERENSEN, S.V., akademik; KRAMARENKO, O.Yu., kand. tekhn. nauk.

Structural strength of nodular cast iron. Vest. mash. 39 no.1: 75-84 Ja '59. (MIRA 12:1)

1.AN USSR (for Serensen).
(Cast iron--Testing)

SERENSEN, S.V.

report presented at the 1st All-Union Congress of Theoretical and Applied Mechanics, Moscow, 27 Jan - 3 Feb '60.

35. N. M. Borodachev (Kuibeshev): On the solution of the dynamic contact problem for a half-space under conditions of axial symmetry.

36. J. Brilla (Bratislava). Anisotropic plates with discontinuous supports.

37. B. M. Broude (Moscow): On the essential non-linearity of certain problems on column stability.

38. E. G. Buglov (Kiev), S. V. Serensen (Moscow): On the determination of safety factors under alternating random loads.

39. A. V. Burlakov (Kharkov): An experimental investigation of creep of turbine diaphragm models.

40. E. F. Burmistov (Saratov): On the stability of constructionally anisotropic circular ring plates.

41. St. Balan, V. Petcu, S. Rautu (Bucharest): The field of application of chromoplasticity.

42. D. B. Bainberg (Kiev): The state of stress of lamellar systems of regular configuration.

43. V. V. Bainshtok (Moscow): Thixotropic properties of lubricants as basis of their rheological characteristics.

44. G. A. Van-Fo-Fi, G. N. Savin (Kiev): Application of Mathieu functions to the investigation of shells.

45. P. M. Varvak (Kiev): Determination of stresses and deformations in massive bodies.

46. B. V. Dedegaev (Gorkii): The flow of bitumens and filled bitumens in pipes.

47. I. I. Vekua, N. I. Muskhelishvili (Tbilisi): Applications of analytic functions in the theory of elasticity.

48. L. Ia. Viner (Tbilisi), V. V. Pinadzhian (Erevan): Experimental investigation of the behavior of excentrically compressed short columns for long loading times.

49. G. V. Vinogradov (Moscow), A. A. Miratov (Kazan), V. P. Pavlov (Moscow): Investigation of soft plastic bodies under combined states of stress.

50. G. V. Vinogradov, V. P. Pavlov (Moscow): Basic peculiarities of the mechanical properties of plastic lubricants.

51. A. I. Vinokur (Leningrad): Fundamentals of the linear theory of visco-elastic impact.

52. L. I. Vinokurov (Kharkov): The solution of dynamic contact problems for foundations using a simplified model.

53. B. F. Vlasov (Moscow): On the equilibrium equations of thick elastic plates.

54. K. F. Voitkovskii (Iakutsk): The creep of ice and frozen soils under combined stresses.

55. M. P. Volarovich, G. Ia. Vorobkov, E. F. Kovalevskii, G. L. Rushman (Moscow): Studies of viscoelastic properties of porous bodies (e.g. peat) by the ultrasonic pulse method.

56. M. P. Volarovich (Moscow), A. Kh. Kim (Minsk): The plane flow of a visco-plastic medium between two planes forming an acute angle.

57. M. P. Volarovich, K. N. Opokin (Moscow): Kinematics and dynamics of the flow of visco-plastic dispersed media past bodies of different shapes.

58. A. N. Volkov (Moscow): On the analysis of a short closed cylindrical shell.

59. S. D. Volkov, N. A. Klimakikh (Sverdlovsk): On the distribution of elastic constants in quasi-isotropic polycrystaline media.

60. I. I. Vorovich (Rostov-na-Donu): A statistical method in the stability theory of shells.

61. I. I. Vorovich (Rostov-na-Donu), A. S. Kosmodamianskii (Saratov): On stress concentration in a plane with an infinite number of holes.

62. S. P. Vlasenskii (Leningrad): Foundations of the general engineering theory of elastic beams.

63. S. S. Vialov (Moscow): The laws of deformation of ice.

64. S. S. Vialov (Moscow): The laws of motion of ice crusts and the theory of visco-plastic flow based on research in the Antarctic.

65. M. D. Galileev (Leningrad): A method of obtaining polynomial stress and displacement functions.

66. K. Z. Galimov (Kazan): A contribution to the theory of the finite deformations of thin shells.

67. M. P. Galin (Moscow): The propagation of elastic-plastic bending and shear waves in the axisymmetrical deformations of shells.

SERENSEN, S. V. & SHNEYDEROVICH, R. M. (Mechan Res Institute of Acad. of Sciences, Moscow)

"On the Plasticity Function Under Cyclic Deformation."

report submitted for the Xth International Congress of Applied Mechanics, Stresa, Italy, 31 Aug - 7 Sep 60.

SPERANSKIY, Nikolay Vasil'yevich; ARTOBOLEVSKIY, I.I., akademik, otv. red.; DIKUSHIN, V.I., akademik, red.; SERENSEN, S.V., akademik, red.; PINEGIN, S.V., prof., doktor tekhn.nauk, red.; LEVITSKIY, A.I., prof., doktor tekhn.nauk, red.; DIMENTBERG, F.M., doktor tekhn.nauk, red.; KOBRINSKIY, A.Ye., doktor tekhn.nauk, red.; RAYEVSKIY, N.P., kand.tekhn.nauk, red.; BESSONOV, A.P., kand. tekhn.nauk, red.; SOKOLOVA-CHESTNOVA, V.A., red.izd-va; SUSHKOVA, L.A., tekhn.red.

[Designing Geneva wheels] Proektirovanie mal'tiiskikh mekhanizmov. Moskva, Izd-vo Akad.nauk SSSR, 1960. 92 p. (MIRA 13:8)

1. AN USSR (for Serensen).
(Mechanical movements)

SERENSEN, S.V.

PHASE I BOOK EXPLOITATION SOV/4375

Akademiya nauk SSSR. Institut metallurgii imeni A.A. Baykova

Ustalost' metallov; materialy soveshchaniya po ustalosti metallov 22-24 sentyabrya 1958 g. (Fatigue of Metals; Materials of the Conference on Fatigue of Metals, September 22-24, 1958) Moscow, 1960. 157 p. 3,500 copies printed.

Resp. Ed.: I.A. Oding, Corresponding Member, Academy of Sciences USSR; Ed. of Publishing House: A.N. Chernov; Tech. Ed.: I.N. Dorokhina.

PURPOSE: This collection of articles is intended for mechanical engineers, metallurgists, and scientific research workers.

COVERAGE: The collection contains discussions relating to fatigue failure of metals, fatigue in finished parts, and methods for testing endurance. Included are a critical review of existing theories on metal fatigue, some data on physical regularity patterns, and features of steel failure caused by fatigue. Possibilities for applying a new criterion to the notch sensitivity of metals and high-strength steels are investigated. The mechanism of failure due to

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GERTS, Yelena Vasil'yevna; KREYNIN, German Vladimirovich; ARTOBOLEVSKIY, I.I., akademik, otv.red.; BLAGONRAVOV, A.A., akademik, red.; BRUYEVICH, N.G., akademik, red.; DIKUSHIN, V.I., akademik, red.; SERENSEN, S.V., akademik, red.; PINEGIN, S.V., doktor tekhn.nauk, red.; LEVITSKIY, N.I., prof., doktor tekhn.nauk, red.; DIMENTBERG, F.M., doktor tekhn.nauk, red.; KOBRINSKIY, A.Ye., doktor tekhn. nauk, red.; RAYEVSKIY, P.P., kand.tekhn.nauk, red.; BESSONOV, A.P., kand.tekhn.nauk, red.; GORSHKOV, G.B., red.izd-va; MAKOGONOVA, I.A., tekhn.red.

[Theory and design of pneumatic power devices] Teoriia i raschet silovykh pnevmaticheskikh ustroistv. Moskva, Izd-vo Akad.nauk SSSR, 1960. 177 p. (MIRA 14:2)

1. AN USSR (for Serensen).
(Pneumatic machinery)

SERENSEN, S.V., akademik, red.; KUDRYAVTSEV, I.V., doktor tekhn.nauk, retsenzent; DANILOV, L.N., red.izd-va; SOROKINA, G.Ye., tekhn.red.; GORDEYEVA, L.P., tekhn.red.

[Endurance test of machine parts; collected articles] Ispytaniia detalei mashin na prochnost'; sbornik statei. Po materialam Komiteta prochnosti NTO Mashproma. Moskva, Gos.nauchno-tekhn.izd-vo mashinostroit.lit-ry, 1960. 226 p. (MIRA 13:4)
(Machinery--Testing)

GROZIN, B.D., otv.red.; DRAYGOR, D.A., zam.otv.red.; BARABASH, M.L., red.toma; KRAGEL'SKIY, I.V., red.; SERENSEN, S.V., red.; FAYNERMAN, I.D., red.; ZASLAVSKIY, S.S., red. Prinimali uchastiye: BRAUN, M.P., prof.; VAYNBERG, D.V., prof.; PETRENKO, I.P., kand.tekhn.nauk; SINYAVSKAYA, M.D., inzh.; SHEVCHUK, V.A., kand.tekhn.nauk; SEMIROG-ORLIK, V.N., kand.tekhn.nauk; YANKEVICH, V.F., inzh.; GORB, M.L., kand.tekhn.nauk; RAKHLINA, N.P., tekhn.red.

[Increasing the wear resistance and useful life of machinery in two volumes] Povyshenie iznosostoikosti i sroka sluzhby mashin v dvukh tomakh. Kiev, Izd-vo Akad.nauk USSR. Vol.1. 1960. 486 p. (MIRA 13:12)

1. Vsesoyuznoye nauchno-tekhnicheskoye obshchestvo mashinostroitel'noy promyshlennosti. Kiyevskoye oblastnoye pravleniye.
(Mechanical wear)
(Mechanical engineering)

SERENSEN, S.V.

DIMENTBERG, F.M., doktor tekhn.nauk; LYUKSHIN, V.S., kand.fiz.-mat.nauk; NIBERG, N.Ia., kand.tekhn.nauk; OBMORSHEV, A.N., prof., doktor tekhn.nauk; PLUZHNIKOV, I.S., kand.fiz.-mat.nauk; UMANSKIY, A.A., prof., doktor tekhn.nauk; ACHERKAN, N.S., prof., doktor tekhn.nauk, red.; VUKALOVICH, M.P., prof., doktor tekhn.nauk, laureat Leninskoy premii, red.; KUDRYAVTSEV, V.N., prof., doktor tekhn.nauk, red.; PONOMAREV, S.D., prof., doktor tekhn.nauk, laureat Leninskoy premii, red.; SATEL', E.A., prof., doktor tekhn.nauk, red.; SERENSEN, S.V., akademik, red.; RESHETOV, D.N., prof., doktor tekhn.nauk, red.; GIL'DENBERG, M.I., red.izd-va; SOKOLOVA, T.F., tekhn.red.

[Reference book for machinery designers in six volumes] Spravochnik mashinostroitelia; v shesti tomakh. Red.sovet: N.S.Acherkan i dr. Izd.3., ispr. i dop. Moskva, Gos.nauchno-tekhn.izd-vo mashinostroit. lit-ry. Vol.1. Pod red.N.S.Acherkana. 1960. 592 p. (MIRA 13:10)

1. AN USSR (for Serensen). (Machinery--Design)

83311

18.8200 also 2308

S/179/60/000/04/010/027
E191/E181

AUTHORS: Borodin, N.A., and Serensen, S.V. (Moscow)

TITLE: On Long-time Static Failure in a Zone of Stress Concentration

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Mekhanika i mashinostroyeniye, 1960, No 4, pp 65-72

TEXT: The analysis of the conditions of creep failure in regions of stress concentration requires a knowledge of the strain and stress distributions in the process of applying the load. The Neuberg solution for the region of a notch is limited to elastic conditions, which prevail only in the beginning with specimens operating for long periods at elevated temperatures. A re-distribution takes place with the appearance of plasticity. Analytical solutions under creep conditions have been obtained by Russian investigators, but without experimental verification. Experimental methods were developed later. The present paper deals with the analysis of the strain and stress condition in the zone of stress concentration near a hole in a thin plate under conditions of creep. The grid method is used in the form of micro-grids introduced earlier for the study of the micro-plasticity of alloys.

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On Long-Time Static Failure in a Zone of Stress Concentration

The grid is inscribed by the diamond pyramid of a micro-hardness tester. The local stress concentrations due to the grid lines of about one micron depth can be ignored under conditions of stress relaxation. The higher resolution demanded in the present paper was achieved by using a comparator with a scale division of 0.3 microns. Precision grids with a pitch from a few microns to 1.5 mm can be drawn to an accuracy of 0.3 microns. V-95 aluminium alloy strips of 30 mm width, 1 mm thickness and a hole diameter of 6 mm, were tested permitting the approximation of an infinitely wide plate in a plane stress state. The tests were conducted at 200 °C. Deformations were measured with the same comparator. With a length of base of 0.4 mm, an accuracy of measurement of 0.05% was possible. Earlier experiments have shown that a length of base amounting to 20% of the notch radius caused an error of only 1.1%, compared with a zero base. Periodically, every twenty hours, the specimens were removed from the testing machine and the deformations measured. With this technique the purely plastic creep deformations were obtained. The elastic components are small

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On Long-Time Static Failure in a Zone of Stress Concentration

and can be accounted for by analysis. A discussion of basic analytical propositions in the range of steady creep and some subsidiary tests are reported to verify the effectiveness of the experimental conditions. To determine the assumption that failure starts not at the hole contour but at some distance from it, in the zone of maximum deformations, specimens were tested in a specially built furnace where they could be photographed during the test with a magnification of 40. Tests to failure of specimens with and without holes were carried out at several levels of nominal stress, in order to determine whether the reduced notch sensitivity at elevated temperatures, as found in short-time static tests, also applies to long-time tests. Among the conclusions from this study, it was found that the concentration of creep deformations around a hole in a plate initially diminishes somewhat for a few hours but remains high throughout the test period. The largest deformation occurs at a distance of 0.2 - 0.3 mm from the hole edge. In the concentration zone, a substantial stress relaxation is observed, but not enough to eliminate a significant stress concentration until

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On Long-Time Static Failure in a Zone of Stress Concentration

failure. The highest rate of relaxation takes place in the first few hours of testing. The failure starts a small distance from the hole edge in a thinned out cross-section of the specimen. The development of a local deformation in the hole region begins substantially earlier than the complete failure of the specimen. The creep strength limit in terms of nominal stresses based on the criterion of the beginning of local deformation is lower in specimens with holes than in solid specimens.
There are 10 figures and 9 references: 7 Soviet, 1 English and 1 German.

SUBMITTED: April 22, 1960

Card 4/4

32025
S/145/60/000/005/007/010
D221/D301

18.8200

AUTHORS: S.V. Serensen, Doctor of Technical Sciences, Professor, and P.I. Kotov, Assistent

TITLE: The Bauschinger effect in ЭИ - 437 (EI - 437B) alloys during cyclic deformations within a wide range of temperatures

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Mashinostroyeniye, no. 5, 1960, 65 - 74

TEXT: The defective elastic properties, i.e. the Bauschinger effect, of the refractory alloy EI - 437B during cyclic loading at normal and high temperature are discussed. These were investigated at a constant amplitude of elastic and plastic deformations using devices mentioned by S.V. Serensen and P.I. Kotov (Ref. 6: Zavodskaya laboratoriya, no. 3, 1960) and by D.F. Ivchenko and P.I. Kotov (Ref. 7: Izv. vuzov. Mashinostroyeniye, no. 12, 1957). The maximum stressing in the period from 0 to 1 is σ_{1t}. The specimen is unloaded, and then strain-

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ed in the opposite direction up to a point where maximum compression, σ_{1c}, takes place. This is followed by unloading and tension and so on. The beginning of a new cycle coincides with the unloading. The amplitude of the experimental deformation is given by

$$\epsilon = \frac{\varepsilon_t + \varepsilon_c}{2} - \frac{\overline{\varepsilon}_c}{2},$$

where ε_t is the elastic and plastic deformation due to tension; ε_c is the same during compression and $\overline{\varepsilon}_c$ is the residual deformation produced by compression. The range of tests covered 20°, 700° and 800°C, on account of the deterioration of mechanical properties of the alloy at about 700°C. The experiments demonstrated a rapid stabilization of the process, regardless of temperature and amplitude. The cyclic deformation in the steady state period is accompanied by marked changes of deformation curves for all temperatures, as well as by decrease of elastic and yield limits. The reversal of deformation at 20°C produced a 30% reduction of the elastic limit during the first cycle, and

The Bauschinger effect in ...

a somewhat smaller decrease of elastic and yield limits in the compression stage. The Bauschinger effect appears also at high temperatures, its stabilization at 700°C is reached in the fourth cycle. The elastic limits for tension and compression decreased by 34 and 41 % respectively for a temperature of 800°C. There is a marked difference in the characteristics when comparing the steady state with the first load cycle at various temperatures. There is a slight increase of yield point at 700°C in the period of stabilization. From the data it is possible to see that the limits of elasticity and yield at 20 and 800°C for tension exceed those due to compression. The reverse is valid for 700°C. The cyclic deformation with amplitudes of 1 % marks a significant drop in the elastic and proportionality limits, and a less significant one in the yield point. At 800°C there is a more pronounced drop in the characteristics. The Bauschinger effect increased with lower residual deformation. There are 7 figures, 1 table and 7 references: 4 Soviet-bloc and 3 non-Soviet-bloc. The references to the English-language publications read as follows: R.L. Wolley, The Bauschinger effect in some face-centred and body-centred cubic

The Bauschinger effect in ...

metals, J. of theoretical, experimental and applied physics, v. 44, no. 383, 1953; L. Bairstow, Phil. Trans. Roy. Soc., v. A, 1910, 210.

ASSOCIATION: Moskovskiy aviatsionnyy tekhnologicheskiy institut (Aviation Technological Institute, Moscow)

SUBMITTED: November 14, 1959

Card 4/4

81813
S/096/60/000/08/013/024
E194/E484

18.8200

AUTHORS: Serensen, S.V., Academician and
Kotov, P.I., Engineer

TITLE: The Process of Elastic-Plastic Strain of Alloy EI-437B Due to Thermal Fatigue

PERIODICAL: Teploenergetika, 1960, Nr 8, pp 60-66 (USSR)

ABSTRACT: To assess numerically the resistance to thermal fatigue of materials that operate under rapidly varying temperature conditions it is important to study the process of elastic-plastic strain but in this respect insufficient attention has yet been paid to strain in the initial stages and after a number of temperature cycles. Elastic-plastic strain of constant amplitude at given temperature is first considered. Since alloy EI-437B loses much of its strength at temperatures above 700°C the tests were made at temperatures of 20, 700 and 800°C with a few at 600°C. The amplitudes of the elastic-plastic strains ranged from 0.3 to 1%. By way of example, Fig 2 illustrates the process of elastic-plastic strain with an amplitude of 1% at temperatures of 20, 700 and 800°C. With cyclic loading the strain process

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The Process of Elastic-Plastic Strain of Alloy EI-437B Due to Thermal Fatigue

becomes stabilized at all temperatures and so the shape and size of the hysteresis loop is stabilized. In the first cycles there is a considerable decrease of the elastic limit and also of the yield point. A number of secondary factors were studied such as the influence of holding for eight hours under stress in the hot condition, preliminary cyclic straining, and transition from one test temperature to another at various rates; but these were found to have little influence on the strain process and the conditions of stabilization at the test temperatures used. For alloy EI-437B there are two regions of stabilization, one from 20 to 700°C and the other over 700°C. The differences between them are briefly discussed and graphs of changes in the remanent strain for a stabilized cycle at various test temperatures are given in Fig 4. Graphs showing the relationship between the remanent strain and the elastic-plastic strain amplitude are plotted in Fig 5 and are approximately

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The Process of Elastic-Plastic Strain of Alloy EI-437B Due to Thermal Fatigue

linear irrespective of temperature. The process of elastic-plastic strain of given amplitude with varying temperature is then considered on a theoretical basis and a diagram of the process is given in Fig 6. The different behaviour of the material at temperatures below and above 700°C is discussed. At temperatures below 700°C stabilization occurs rapidly. At temperatures above 700°C the mechanical strength of the material is lower when it is hot than when it is cool and so the process is asymmetrical. This has the effect of increasing the remanent strain. The process of elastic-plastic strain during thermal fatigue is then considered. This process takes place at variable temperature, the cyclic loading resulting from thermal expansion and contraction of the material. The process is described with reference to the theoretical cyclic strain diagram of Fig 7. The sample is represented as a combination of rigid and elastic elements. The approximate analysis

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of the process shows that during thermal fatigue, the process of elastic-plastic strain becomes stabilized under any cyclic thermal conditions. At temperatures below 700°C the process is practically symmetrical but at temperatures above 700°C, because the strength of the material is reduced, the compressive stress is appreciably lower than at lower temperatures. Moreover, as will be seen from the diagrams of Fig 8 and 9 which correspond to models with and without the elastic elements, the hysteresis loop is greater at the higher temperature. The reasons for this are discussed. The above consideration of the process of elastic-plastic strain during thermal fatigue shows that laboratory test conditions can reproduce the typical cases of strain due to thermal stresses that occur during cyclic heating of parts. To analyse the corresponding thermal stresses and conditions of reproduction of the process of elastic-plastic strain, it is necessary to know the relationship between the stresses and strains with different numbers

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of cycles and at suitable temperatures. These diagrams can be obtained by the procedure described in the first part of the article. There are 9 figures and 8 references, 5 of which are Soviet and 3 English.

ASSOCIATION: TsIAM

Card 5/5

4

SERENSEN, S.V.; KRAMARENKO, O.Yu.; KULIKOVSKAYA, O.V. [Kulykivs'ka, O.V.]

Mechanical properties and structure of nodular iron. Nauk.pratsi Inst.lyv.vyrob.AN URSR 9:51-65 '60. (MIRA 15:3)
(Cast iron--Metallography) (Hardness)

SERENSEN, S.V., akademik

Fatigue and static strength calculation for nonstationary conditions at high temperatures. Vest. mashinostr. 44 no.6: 35-37 Je '64. (MIRA 17:8)

1. AN UkrSSR.

SERENSEN, S.V. (Moskva); SHNEYDEROVICH, R.M. (Moskva)

Criterion of the carrying capacity of parts at a low number of loading cycles. Mashinovedenie no.2:70-78 '65.

(MIRA 18:8)

S/122/60/000/010/002/015
A161/A030

AUTHORS: Serensen, S.V., and Buglov, Ye.G., Academicians

TITLE: Presentations of Load Variation Probability in Machine Parts

PERIODICAL: Vestnik mashinostroyeniya, 1960, No. 10, pp. 10-17

TEXT: The existing calculation methods and data of statistical studies of work load and fatigue are discussed with references to existing works (Soviet and foreign). The cases considered are of stationary loads as in crankshafts of internal combustion engines, gas and steam turbine blades, parts of presses producing similar parts by a limited number of strokes, and of nonstationary loads as in most transport, road, mining, farming and technological machines. The data on the load amplitude spectrum from several works are used for plotting the amplitude spectra and load cycles per time unit for various parts (rail fish plates, farming machine parts, automobile chassis and springs, automobile rear axle, vertical oscillations of RR car top structure). It is concluded that a presentation of load dissipation in spectra in general form (i.e. in function of many parameters characterizing a spectrum) is a difficult problem in view of the multiplicity of possible

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Presentations of Load Variation Probability in Machine Parts

spectra, but in practical work entailing many parts the spectrum variations are comparatively simple, in the form of similarity transformations. Therefore the variations may be presented by one parameter only (e.g. mean amplitude), and the probabilities in function of this parameter. Probable deviations may be given in first approximation by indicating the upper and lower limit by the cycles numbers and spectra for the practically possible loads, for instance for automobile, assuming exclusively favourable and exclusively unfavourable road conditions for the total life of the automobile. Statistical stress variations' characteristics must be used for the base in calculating work loads and strength reserve of parts. There are 12 figures and 24 references of which 15 are Soviet, 3 Polish, 5 English and 1 German.

ASSOCIATION: AN USSR (AS UkrSSR)

Card 2/2

25092

24.4200
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S/122/60/000/011/005/020
A161/ A127

AUTHORS: Serensen, S. V., Academician of the AS UkrSSR;
Buglov, Ye. G., Engineer

TITLE: The strength of parts in connection with probability interpretation of load and fatigue characteristics

PERIODICAL: Vestnik mashinostroyeniya, no. 11, 1960, 23 - 32

TEXT: The topics discussed in this article had been presented at the Inter-Technical Institute Conference on Strength at the MVTU imeni Bauman in Oct. 1959, and at the All-Union Assembly on Mechanics in Jan. 1960. Fatigue test results are interpreted from experimental data of studies by A. Freudenthal, R. Heller (Ref. 5: On Stress Interaction in Fatigue and a Cumulative Damage Rule, "Journal of the Aerospace Sciences", Vol. 26, July 1959, No. 7) and A. Freudenthal, R. Heller (Ref. 6: Accumulation of Fatigue Damage, Fatigue in Aircraft Structures, Academic Press, Inc., New York, 1956). Tests of SAE4340 steel are presented in logarithmic probability coordinates and the theory of probability is recommended to be used in the estimation of the dependability of parts. Graphical analysis is suggested for the calculation of the probability of failure

Card 1/9

S/122/60/000/011/005/020
A161/A127

The strength of parts in connection with .....

for the general case of stationary and non-stationary loads. The authors, referring to an article published by them in (Ref. 4: Vestnik mashinostroyeniya, No. 10, 1960) emphasize that probability interpretations of variable load rates of parts may be based on the amplitude spectra and the accumulated number of cycles of effective stresses, strength analysis conditions provided. Conditions of destruction by fatigue are described on the basis of static treatment of endurance limits and the number of cycles, needed to achieve the case of destruction, and also on the basis of probability interpretations of effective stresses. Furthermore, the application of the probability theory to the determination of the reliability of operating parts may lead to a more objective interpretation of the endurance by the probability of destructibility or non-destructibility for a given time lapse of service time. Integral calculus of the probability of destruction is illustrated by Figure 5 and 6. Two practical examples of probability calculations are included: Calculation of the destruction or failure probability of a crankshaft at one of its cheeks (Figure 12) and of an automative transmission shaft of a self-propelled machine (Figure 13). According to the assumed linear dependence of the bending stress amplitude in the cheek of the shaft on the value of non-axiality of the bearings 6 (e.g., on the relative displacement of the mid bearing sup-

The strength of parts in connection with ....

port of a three-bearing shaft) and in accordance with the normal distribution of probabilities of the values δ, the following formulas were derived for the probability of the load characteristics of the crankshaft:

$$\phi_q = \frac{1}{\sqrt{2\pi}\, S_q} e^{-\frac{(\sigma - \bar{\sigma}_q)^2}{2 S_q^2}}$$

where σ_q is the amplitude of the rated fluxural stresses in the cheek of the shaft corresponding to the most probable value of non-axiality of the bearing supports occuring during the operational process; S_q the mean square deviation of the amplitude. Figure 12 includes also a fatigue diagram according to the parameter of the number of cycles, values and concentrations of stresses which were close to those of an actual shaft. The limit positions of the curves, e.g., of the curve P_r, determining the endurance limit of the stresses and used in the calculation of the failure probability are approximately described by the regular law of distribution of the probabiltiy according to the formula

The strength of parts in connection with ....

$$P_r = \int \frac{1}{\sqrt{2\pi}\, S_r} e^{-\frac{(\sigma - \bar{\sigma}_r)^2}{2S_r^2}} d\delta$$

where $\bar{\sigma}_r$ is the average value of the endurance value; S_r is the average square of the endurance limit. Calculation of the failure probability was based on a graphical analytical method using the following parameter values of statistical distributions: σ_q = 7,75 kg/mm^2; S_q = 1 kg/mm^2; $\bar{\sigma}_r$ = 12 kg/mm^2; S_r = 0.432 kg/mm^2. The data obtained are included in the table. In the case of the transmission shaft, a diagram was plotted to determine the relation between the life endurance and the allowable mean stress amplitude based on the failure probability parameter in order to be able to trace such variable factors as e.g., the guaranteed life (determined by the value n_{sum}) and the part dimension factor (estimated by changes of the $\bar{\bar{\sigma}}_a$ factor, a mean amplitude value of an amplitude spectrum for non-stationary stress loads). Considering $\bar{\bar{\sigma}}_a$ mean stress amplitude for the basic load conditions in the given calculation one may determine, by means of the diagram (Figure 13), a) the failure probability or the life safety longevity of all parts in question or b) the dimensions of parts to be designed with a given life endur-

The strength of parts in connection with ....

ance and allowable failure probability. The adoption of a certain failure probability value, e.g., 0.005, indicating that operational life of a great number of parts, e.g., 0.5 %, will break down prior to the predetermined rated life has to be based on analyses of operational features of existing designs, on the standards of their dependability and on economic considerations. Furthermore, the dissipation of life endurance under operational conditions in connections with the safety factor are discussed. Based on the methods for determination of the failure probability it is possible to establish relations between the scattering of load and fatigue characteristics of a set of parts on the one hand, and the scattering of the life and assembly units in operation on the other hand. The following formula for the safety factor

$$n_{-1} = \sqrt[m]{\frac{A}{a}}$$

has been established. According to the same in case of the exemplatory crankshaft, 1.55 has been obtained. It is considered as being not adequate enough if in addition to the dissipation of load and fatigue characteristics the life endurance and failure probability is not involved. There is no doubt that the reliability in

The strength of parts in connection with ....

the determination of the safety factor and of its numerical value in connection with probability interpretation has to be based on accurate and complete initial data on the load spectra and the fatigue resistance of metals applicable to the parts in question (dimension factor, non-homogeneity of stress condition, surface finish, quality etc.). Therefore, the results of probability interpretation have to be considered above all from the conceptional point of view on the specific effect of various factors on the strength of parts by simultaneously implicating the changeability of operational loads and mechanical properties. As to the single and different results obtained for the safety factor and its probability value, they have to be evaluated in connection with operational data from the operating machine prior to the accumulation of systematical test experiences based on the use of probability interpretation methods for the strength of parts. There are 16 Figures, 1 Table and 11 references: 8 Soviet-bloc and 3 non-Soviet-bloc. The two English-language references have been mentioned in the body of the abstract.

Card 6/9

32709
S/145/60/000/012/004/008
D221/D301

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AUTHORS: Serensen, S. V., Doctor of Technical Sciences, Professor, and Kotov, P. I., Engineer

TITLE: Investigating the process of elastic and plastic deformation of the ЭИ-437Б (EI-437B) alloy during cyclic loading

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Mashinostroyeniye, no. 12, 1960, 110-126

TEXT: The amplitudes of deformation were 0.3, 0.5, 0.8 and 1.0% and the temperature levels 20°, 700° and 800°C. Methods of testing and equipment were described in previous papers. The analysis of data obtained shows rapid stabilization of the process (after 3rd - 5th cycle). There is a marked influence of the Bauschinger effect on the second and subsequent cycles. At temperatures of 20 and 700°C an insignificant increase of the maximum stress due to compression and tension is noticed. At 800°C there is an inverse phenomenon of reduced maximum stress as compared to the first

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Investigating the process ...

cycle. The process in the stabilized state is asymmetrical for all temperatures, the stress amplitude at compression being larger than at tension. The elastic modulus does not vary essentially, but the elastic part in a stabilized cycle is markedly shorter than in the first cycle. There was no perceptible effect of preliminary deformations on the process of stabilization. The resistance of the alloy to elastic and plastic deformations at 800°C has a singular character, consisting in an essential change of the stress amplitude in comparison with lower temperatures. Variation of temperature from 20 to 700°C, does not affect the deformation process at 700°C. At 800°C, if the specimens were tested first at low temperatures, there is a drop of stress and an increase of residual stress. Previous tests at 700°C or 800°C affect essentially the process at 20°C. The importance of pauses in the process depends on temperature. The exposure at 700°C which is the aging temperature of this alloy seems to restore the initial properties and causes a change in the deformation pattern. Further examinations resulted in coincidence of curves of stabilized cycles be-

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fore and after the pause. There are 14 figures and 6 references: 4 Soviet-bloc and 2 non-Soviet-bloc. The references to the English-language publications read as follows: E. E. Balwin, G. I. Sokol and L. F. Goffin, American Society for Testing Materials, Proceedings, v. 57, 1957, 567-586; H. Majors, Trans. of American Society for Metals, v. 51, 1959, 421-437.

ASSOCIATION: MATI

SUBMITTED: March 26, 1960

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Card 3/3

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68283

S/032/60/026/02/029/057
B010/B009

AUTHORS: Serensen, S. V., Borodin, N. A.

TITLE: Peculiarities of Tests of the Static Fatigue Strength of Aluminum Alloys

PERIODICAL: Zavodskaya laboratoriya, 1960, Vol 26, Nr 2, pp 193 - 197 (USSR)

ABSTRACT: Investigations of the effect of the absolute dimensions of samples upon the static fatigue strength in the case of dilatations of the V95 aluminum alloy were carried out. The stresses in this alloy are relieved and it becomes more plastic when subjected to rather high temperatures for a long time. The fatigue strength tests were carried out by means of K-3A and DST-5 machines at 200°. An analysis of the results obtained and the statistical evaluation of the experimental data (Table) permits the following conclusions to be drawn: The influence of the absolute dimensions of the samples upon their fatigue strength is basically determined by a reduction of the uniform plastic deforming capability with the increase in absolute dimensions. It is inexpedient to test the fatigue strength of samples with diameters below 3-6 mm. If such samples are used,

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Peculiarities of Tests of the Static Fatigue Strength of Aluminum Alloys

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B010/B009

the effect depending on the order of dimension of the sample must be taken into account at the transition to the results obtained with samples of diameters of 8-10 mm. A reliable evaluation of the effects of technological and constructional factors (e.g., the absolute dimensions of the samples) upon the fatigue strength is possible only if the values found are analyzed in consideration of their spread. For this purpose the tests must be carried out with the same stress on a number of samples (at least 15-20), and the values obtained must be treated statistically on the basis of the normal logarithmic law of distribution. The papers by T. A. Kontorova and Ya. I. Frenkel' (Ref 2) and N. G. Plekhanova and S. I. Ratner (Ref 5) are mentioned in the paper. There are 5 figures, 1 table, and 5 references, 4 of which are Soviet.

ASSOCIATION: Moskovskiy aviatsionnyy tekhnologicheskiy institut (Moscow Aviation Technological Institute)

AUTHORS: Serensen, S. V., Kotov, P. I.

S/032/60/036/03/031/064
B010/B005

TITLE: Apparatus and Method of Investigating the Process of Elastic-plastic Deformation in Elongation - Compression

PERIODICAL: Zavodskaya laboratoriya, 1960, Vol ~~36~~ 26, Nr 3, pp 332-335 (USSR)

TEXT: This paper describes an apparatus (designed by M. S. Soskov) to test samples for repeated, varying plastic deformation (elongation - compression), as well as the method of plotting deformation diagrams. A diagram of the apparatus (Fig 1), and one of the hydraulic system of the testing machine (Fig 2), are given. For tests at high temperatures, an electric furnace is installed in the apparatus. A system of 12 transmitters is used as a dynamometer for measuring the load. Besides elongation - compression tests, the apparatus can also be used to carry out torsion tests with a larger amplitude of plastic deformation for which a special mechanism is provided. Special tubular samples (Fig 3) are used to obtain deformation diagrams (elongation - compression) over wide temperature ranges. The deformation was read off by a special optical device, the sample being marked for this purpose. A deformation diagram (Fig 4) of the EI 437 B alloy obtained on the device described (at 700°) is given as an example. There are 4 figures and 3 references, 2 of which are Soviet.

Card 1/1

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AUTHORS: Serensen, S. V. and Kotov, P. I.

TITLE: Reproduction of the Process of Elastoplastic Deformation in Thermal Fatigue

PERIODICAL: Zavodskaya laboratoriya, 1960, Vol. 26, No. 10, pp. 1133-1136

TEXT: The authors discuss the process of destruction of workpieces by thermal fatigue due to cyclic thermal stresses in turbo-engines. Fig. 1 schematically shows a simulation of elastoplastic deformation in thermal fatigue. The authors derive the deformation equations for different temperature cycles. By means of these, the values for rigidity, and the cyclograms of deformation at constant, but different, temperatures which are sufficiently close together, it is possible to characterize the deformation process $\delta_1 = f(\tau)$ of a sample under cyclic stress, which simulates the process of elastoplastic deformation in thermal fatigue. The authors stress the fact that the reproduction of thermal fatigue involves considerable difficulties. Apart from the fact that the apparatus

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Reproduction of the Process of Elastoplastic Deformation in Thermal Fatigue

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B016/B054

with preset thermal conditions and a corresponding stress is very complicated, several experiments must be carried out before to determine the law $\delta_1 = f(\tau)$ (as well as $\sigma = F(\tau)$) (in order to establish deformation diagrams). This must be done for different constant temperatures within the respective temperature range of the thermal cycle. At the same time, the investigation of elastoplastic deformation (e.g., according to L. Coffin, Ref. 4, or the authors' paper of Ref. 5) is rendered difficult by several circumstances. For these reasons, the simulating tests described would offer - in spite of the difficulties mentioned - better possibilities of investigating elastoplastic deformation. Further, this method will be of particular importance in studying the characteristic features of the accumulation of plastic deformations, and, what is more, in studying the conditions of destruction by thermal fatigue. There are 3 figures and 6 references: 4 Soviet and 2 US.

GROBOV, Valerian Aleksandrovich; ARTOBOLEVSKIY, I.I., akademik, otv. red.; DIKUSHIN, V.I., akademik; red.; SERENSEN, S.V., akademik, red.; PINEGIN, S.V., doktor tekhn. nauk, prof., red.; LEVITSKIY, A.I., doktor tekhn. nauk, prof., red.; DIMENTBERG, F.M., doktor tekhn. nauk, red.; KOBRINSKIY, A.Ye., doktor tekhn. nauk, red.; RAYEVSKIY, N.P., kand. tekhn. nauk, red.; BESSONOV, A.P., kand. tekhn. nauk, red.; ORPIK, S.L., red. izd-va; LAUT, V.G., tekhn. red.

[Asymtotic methods for calculating bending vibrations of turbomachine rotors] Asimptomicheskie metody rascheta izgibnykh kolebanii valov turbomashin. Moskva, Izd-vo Akad. nauk SSSR, 1961. 165 p. (MIRA 14:5)

1. Akademiya nauk USSR (for Serensen)
(Impellers--Vibration)

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PHASE I BOOK EXPLOITATION SOV/5940

Serensen, Sergey Vladimirovich, Academician, Academy of Sciences UkrSSR, Yevgeniy Georgiyevich Buglov, Mikhail Ernestovich Garf, Leonid Aleksandrovich Kozlov, Nikolay Ivanovich Korsakevich, Oksana Yur'yevna Kramarenko, and Ol'ga Borisovna Slutskaya

Prochnost'pri nestatsionarnykh rezhimakh nagruzki (Strength Under Nonstationary Loading Conditions) Kiyev, Izd-vo AN UkrSSR, 1961. 294 p. 2000 copies printed.

Sponsoring Agency: Akademiya nauk Ukrainskoy SSR. Otdeleniye tekhnicheskikh nauk.

Ed. of Publishing House: O. M. Pechkovskaya; Tech. Ed.: V. Ye. Sklyarova.

PURPOSE: This book is intended for engineers of design bureaus, industrial laboratories, and testing stations, and for

Card 1/7

SERENSEN, S.V., akademik; KOGAYEV, V.P., kand.tekhn.nauk, dotsent

Durability of machine parts considering the probability of a breakdown in case of an unsteady variable loading. Vest.mashinostr. 46 no.1:7-12 Ja '66. (MIRA 19:1)

1. Akademiya nauk UkrSSR (for Serensen).

SERENSEN, S. V.

"Damage Accumulation under Non-Stationary Conditions of Service." Report submitted for the Conference on Design and Strength Analysis, Hungarian Acad. Sci. Oct. 1961.

S/766/61/000/000/001/003

AUTHORS: Serensen, S.V., Kogayev, V.P., Beksh, T.A.

TITLE: The effect of the absolute dimensions and the probability of fatigue failure.

SOURCE: Statisticheskiye voprosy prochnosti v mashinostroyenii. Ed. by S.V. Serensen. Moscow, Mashgiz. 1961, 9-19.

TEXT: The paper reports the results of an experimental investigation of the statistical fatigue characteristics of Mark-45 steel as functions of the prevailing stress nonuniformities and the absolute dimensions of the specimen cross-section. Single-plane bending tests were performed on the [redacted] (IMASh) electrodynamic resonance testing machine described by S.V. Serensen et al. in Vestnik mashinostroyeniya, no.6, 1959. The test frequency was 280 cps. All specimens were made from 50-mm normalized rods of a single smelting batch. Specimens with diam 25, 15, and 7.5 mm were prepared, both without stress concentrators (smooth) and with grooves having a rectified hyperbolic profile. The geometry, the theoretical stress-concentration coefficient, and the relative stress gradient for the various specimens are tabulated. A mean of 20 specimens were tested at each stress level. The statistical-analysis method of V.P. Kogayev (Zavodskaya laboratoriya, no.5,

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The effect of the absolute dimensions ...

1957; Vestnik mashinostroyeniya, no. 1, 1959) is employed. The findings are plotted on semilog total-probability diagrams. Abscissae: log N (number of cycles to incipient formation of fissures, per Serensen, cited above). Ordinates: Failure probability P in a scale based on the normal-distribution law. Parameter: Stress σ. 90%-confidence bands for the various stress levels are also drawn. A cross-plot yields also a linear σ-versus-log N diagram in which the failure probability P serves as a parameter for the curves (or confidence bands). The fatigue curves for a failure probability P=0 is plotted by the "sensitivity-threshold" N, which, according to N. Nogayev (cited above) is defined as that N at which the failure probability is zero. The Nogayev method of determining the sensitivity threshold (ST) for low stresses is summarized; for high stresses a P=0.02% (instead of zero) is assumed to define the ST. Another cross-plot, showing P vs. σ for a given N (for example, $N=10^7$ cycles) provides one curve each for a given specimen geometry. A listing of literature on the effectiveness of stress concentration in terms of the maximal-stress dependence on the principal-stress gradients and the absolute dimensions of the cross-section is adduced. It is submitted that the intensity of the maximal stresses in stress-concentration zones (assuming an elastic distribution) that correspond to the endurance limit for any given number of cycles, depends on the relative principal-stress gradient and the dimensions of the cross-section somewhat as in the case of the nominal stresses; however, the character of this dependence is strongly

Card 2/3

linked with the failure probability. With decreasing failure probability it is found that not only does the intensity of the maximal stress and the corresponding number of cycles required to produce failure decrease, but there is also a weakening of the effect of nonuniformities of the stress distribution and of the absolute cross-sectional dimensions on the intensity of σ_{max}. The relationship between the failure probability and the similarity laws in fatigue failures is so substantial that it must be taken into account in the experimental assessment of these factors and their use in stress analysis. The further accumulation of fatigue characteristics (acquired experimentally) in a probabilistic interpretation, with due consideration of the peculiarities of the similarity laws, should enhance the reliability of stress analysis and provide a better substantiation for a selection of permissible stresses and margins of safety, especially in large machines and structures. There are 9 figures, 1 (unnumbered) table, and 15 references (13 Russian-language Soviet and 2 English-language: Freudenthal, A.M., Gumbel, E.I., Failure and survival in fatigue, J.of Appl.Physics, v.25, no.11, November 1954; Weibull, W. A statistical representation of fatigue failure in solids, Royal Institute of Technology, Stockholm, Transactions, no.27, 1949).

ASSOCIATION: None given.

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29072
S/179/61/000/004/016/019
E081/E335

11,2313

AUTHORS: Serensen, S.V. and Shneyderovich, R.M. (Moscow)

TITLE: Investigation of the stress state and strength in elastoplastic cyclical deformation

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Mekhanika i mashinostroyeniye. no. 4, 1961, pp. 136 - 140

TEXT: According to previous work (Gusenkov, A.P. and Shneyderovich, R.M. - this journal, no. 2, 1961), the stress-strain diagram for elastoplastic cyclic deformation in the k-th half-cycle can be written as:

$$\varepsilon^{(k)} = \frac{A}{k^{\alpha}}\left[f\left(\frac{s}{2}\right) - 1\right] + s \qquad (1)$$

where the stress s and the strain ε are expressed in terms of the stress σ_m and the strain e_t at the yield value, A and α are parameters of cyclic deformation,

Card 1/2

Investigation of ....

f(s/2) is the stress-strain diagram for a single deformation. After transforming the equation to allow for linear hardening, it is applied to finding the relation between the twisting couple and angle of twist for $A = 1.5$, $\alpha = 0.5$ and $k = 1, 2, 5, 10, 100$ half-cycles. An approximate solution to this problem is also derived and is compared with the exact solution. Further development of the analysis enables the stress-distribution in a perforated strip to be calculated and the bearing of the results on the problem of fatigue failure is briefly discussed.
There are 6 figures and 2 Soviet-bloc references.

SUBMITTED: March 17, 1961

Card 2/2

S/122/61/000/005/003/013
D221/D304

AUTHORS: Serensen, S.V., Academician AS USSR, Kramarenko, G. Yu., Candidate of Technical Sciences, and Kulikovskaya, G.V.

TITLE: Kinematics of fatigue destruction of cast iron containing spheroidal graphite

PERIODICAL: Vestnik mashinostroyeniya, no. 5, 1961, 14 - 19

TEXT: The presence of spheroidal graphite in cast iron imparts a peculiar character to fatigue destruction of the latter, compared to the similar process in steel. Study of this phenomenon was carried out with consideration of technology of its production, structural features and type of load. The tested material was produced in an electric furnace with additions of magnesium and ferrosilicate. Its composition was as follows: 3.14 - 3.34 % C; 2.30 - 2.58 % Si; 0.68 - 0.72 % Mn; 0.010 - 0.019 % S; 0.10 - 0.12 % P, and 0.05 - 0.052 % Mg. The cast iron was subject to annealing at 550-600°C during 4 hours. It contained a small quantity of ferrite on the

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D221/D304

Kinematics of fatigue destruction ...

fringe of graphite inclusions. Two structural variants were obtained through heat treatment: Pearlitic after normalization, and ferritic - due to annealing. Investigation of destruction was carried out on plain specimens by testing symmetrical bending and torsion. The surface of the specimen was observed with the use of a microscope. Metallographic study of destruction of individual structural components was also carried out microscopically. Fatigue destruction of cast iron was tested at various levels of stressing. Appearance of damage on the surface always begins with graphite inclusions, independently of the structure. Damage in the metallic base is also at spots where graphite is near the surface. Not all these cracks develop during further experiments. The authors referred to cracks with a maximum length of 0.25 mm as a first stage. The duration of this stage depends upon the level of stressing. The second stage is characterized by growth of one or more figures. Individual fissures converge in the direction of the weakest spots of the metallic matrix, and at the same time they grow at the surface and in depth. The rate of this increase depends upon stress and structure of cast iron. At a certain point there is a sharp change

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Kinematics of fatigue destruction ...

in the above speed of growth which signifies the start of the third stage, when separate parts of cracks are united and form one or several main fatigue cracks. The working section of specimen is, therefore, reduced, stress is increased, and finally, the ultimate destruction takes place. Metallographic study established that the form of graphite is of great importance. Irregular shape promotes concentration of stresses in the matrix, and earlier creation of cracks, and apparently reduces the number of cycles required for destruction. During deformation of ferritic and pearlitic matrices around graphite inclusions, the latter are not subject to destruction. Destruction in ferrite is characterized by marked plastic deformations and, the appearance of shear lines within the boundary of individual grains. Fatigue crack in ferritic cast iron takes place between graphite inclusions across the grains of ferrite as well as along its boundary. Quantitative analysis of experimental data allows several laws on the development of fatigue destruction of cast iron with spheroidal graphite to be deduced. An assumption was made that the largest crack characterizes the degree of damage. The length of it on surface was designated as l_m. The three stages

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Kinematics of fatigue destruction ...

described above are plotted by the authors. Graphs of the increase in fatigue destruction in pearlitic and ferritic cast iron obtained with 10 - 15 specimens are plotted in Fig. 9. It is seen that increase of stress from 1.13 to 1.6 of the endurance limit results in a change of duration of individual stages as well as rise of rates of growth of destruction, v_1 and v_2, in the II and III stages. Curves showing destruction of three structural variants of cast iron and of steel 45 are also illustrated. The life of cast iron during these tests is mainly determined by the duration of stage II which increases with lower stresses. The relationship between speeds v_1 and v_2 and the level of stressing as well as the effect of structure on former is given graphically. Characteristics of stage III and the length of maximum crack at the instant of destruction are affected by the structure. Greatest length of crack is found with ferritic cast iron. A characteristic feature of fatigue destruction of cast iron with spheroidal graphite is the large amount of initial fatigue cracks, i (up to 80), of which one or two exhibit a further expansion (i_m). The data allowed fatigue curves

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from the initial crack N_1 to final destruction N_d to be plotted (Fig. 12). The presence of stress concentrations produces a substantial change in the course of development of fatigue destruction of cast iron with spheroidal graphite.. The author draws the following conclusion: The discussed type of cast iron exhibits an early formation of fatigue damage which is characterized by three stages. Duration of individual stages and length of cracks depend upon level of stress and structure of metallic matrice. For components, where the early appearance of cracks is undesirable, a less plastic cast iron should be used, and having a pearlitic structure. There are 13 figures and 4 tables.

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S/145/61/000/005/006/009
D221/D306

AUTHORS: Serensen, S.V., Doctor of Technical Sciences, Professor, and Kotov, P.I., Aspirant

TITLE: Approximation of deformation graphs during cyclic loading of alloy, ЭИ-437Б(EI-437B) beyond the limit of elasticity and within a wide range of temperatures

PERIODICAL: Izvestiya vysshykh uchebnykh zavedeniy Mashinostroyeniye, no. 5, 1961, 60 - 73

TEXT: The article discusses the problem of approximation of curves of cyclic elastic-plastic deformation of EI-437B alloy at temperatures of 20, 700 and 800°C. The investigation demonstrated that there is a rapid stabilization of the process. The limit of strength and the yield point on compression as well as on tension drop prior to stabilization, and two temperature zones are noticed. Concurrently, the modulus of elasticity changes with the number of cycles. The most widely used method of approximation is the polyzonal relationship (Fig. 3a) and the parabolic procedure of Fig. 3b.

Card 1/8

For the section of uniform plastic deformations use is made of stepped (Fig. 3c) and partial linear relationships, that are described by G. I. Dikman (Ref. 8: O krivykh povtornoy plasticheskoy deformatsii, Prochnost' detaley aviatsionnogo dvigatelya, Sb. statey, no. 24, Oborongiz, 1957). Data indicate that tension at 20°C is characterized by linear behavior beyond the elastic limit and

$$\sigma_i = E \cdot \varepsilon_i \left[1 - \lambda\left(1 - \frac{\varepsilon_0}{\varepsilon_i}\right)\right] \qquad (1)$$

is proposed as an approximation. The graph at 700°C reveals a curvilinear character. Preliminary analysis indicates the possibility of using

$$\varepsilon_0 = \frac{\sigma_0}{E} \quad (2), \qquad \sigma_0 = \frac{\sigma_y + \sigma_T}{2} \quad (3), \qquad E_1 = \frac{\sigma_m - \sigma_0}{\varepsilon_m - \varepsilon_0} \quad (4)$$

for the deformations at the start of linear changes. In above equations (including Eq. 1) σ_0 is the deformation at the start of stressing [Abstractor's note: No explanation given about remaining

designations]. σ'_m is the stress of maximum deformation ε_m. The stress parameter λ is determined by interpolating the stress modulus E_1 at temperature t_1 on the basis of data for 20 and 700°C. The large errors involved with the use of polynomial approximation makes it unsuitable for graphs of cyclic deformations. In problems where the curvilinear section is important, then the deformation graph is presented in three sections as in Fig. 3b, where the curved part can be approximated by a parabola with α as an exponent. In this case

$$\sigma_i = \sigma_T - E''(\varepsilon_T - \varepsilon_i) - (E' - E'') \frac{\varepsilon_T - \varepsilon_i^\alpha}{(\varepsilon_T - \varepsilon_{pc})^{\alpha-1}}, \quad (5)$$

$$\alpha = \frac{E - E''}{E' - E''} \quad (6)$$

are used. The boundary of the curvilinear section can be formed by the limit of proportionality and the conditional yield point, and

Approximation of deformation ...

the approximation is ensured by taking into account the Bauschinger effect for cyclic deformation. Comparison of experimental data with results of parabolic approximation is given. The deformation graphs for some materials are quite well aprroximated by the step function of

$$\sigma_i = A\varepsilon_i^{\alpha} \qquad (10)$$

when beyond the limit of elastic deformations (Fig. 3c). In the above A and α are some coefficients determined by experiments from two limit points. Analysis of deformation graphs for all temperatures revealed two characteristic zones, where the step approximation is defined by various parameters A and α. The variants of approximation suffer from disadvantages, in particular as it is necessary to deal with three sections of deformation. The use of partial linear approximation given by

$$\sigma_i = \frac{\alpha\varepsilon_i + \beta}{\varepsilon_i + \gamma}, \qquad (11)$$

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